Research Article

Effects of a Program of Obesity's Rehabilitation in an under Developed Country

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ABSTRACT

Background: Obesity is a major public health concern.

Objective: To analyze effects of a rehabilitation program on adult obese in Cotonou.

Methods: It was a prospective, cross-sectional, descriptive and analytical study, conducted from January to June 2016 (06 months), on 122 adult obese subjects, recruited in some gymnastics clubs and the Department of Physical Medicine and Rehabilitation of the CNHU-HKM of Cotonou. A program of physical activity were done during 20 sessions. Clinical and biological parameters were evaluated in these subjects before and after the program. Comparing the beginning and ending values of those parameters, their evolution were evaluated.

Results: Most of these patients were females (94.26%) aged 46.3 ± 9.70 years. Their mean BMI was 37.26 ± 5.04 kg/m^2 with an android obesity (45.9%) or a mixed one (54.1%). The fat mass index (FMI) was 47.95 ± 7.56%. Hypercholesterolemia (59.02%) and hypertriglyceridaemia (9.02%) were observed at the beginning of the program. At the end of the rehabilitation program, anthropometric parameters of patients were improved more markedly than those of lipids. No clinical or biological parameters studied were significantly associated with patient's BMI and FMI changes ($p > 0.05$).

Conclusion: The exercise program has shown encouraging results and is therefore interesting to be applied to a larger population in underdeveloped countries.

Keywords: Obesity; Rehabilitation; Physical activity; Cotonou

INTRODUCTION

Obesity is increasingly a major public health concern worldwide. Indeed, it is no longer just a disease of developed countries, because we have a progressive urbanization, changing in lifestyles (food and sedentary lifestyle) of population in underdeveloped countries. In Benin, according to Acakpo's et al. work in 2000, prevalence of obesity was 16.8% [1].

Consequences of obesity include cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders, certain cancers (endometrium, breast, colon), etc. Its management includes diet therapy, physical activity, behavioral therapy, pharmacotherapy and surgical procedures as appropriate [2,3].

Obesity leads to physical deconditioning of the subject. Exercise training, particularly associated with dietary advice, is therefore essential in the management of obese people [4,5]. This study aimed to analyze effects of a rehabilitation program on adults obese patients in Cotonou.

PATIENTS AND METHODS

Type and period of study

It is a cross-sectional prospective study, aimed to be descriptive and analytical. It was conducted from January to June 2016, i.e., six (06) months.

Study population and sampling

The study population was made of adults obese subjects living in (or near) Cotonou. These subjects were recruited, mainly from gymnastics clubs in Cotonou. To them were added obese patients admitted to the Physical Medicine and Rehabilitation (PMR) Department of the CNHU-HKM, admitted for obesity, low back pain or other musculoskeletal disorders. The sampling was carried out taking into account inclusion and non-inclusion criteria listed below.

Inclusion criteria

Were enrolled in the study, subjects who:

• had, at least, a body mass index (BMI) greater than 30 kg/m^2.

• aged between 18 and 65 years.

• almost completely recovered from pains related to low back pain or musculoskeletal disorders,

• with conventional functional rehabilitation sessions.

• resided in Cotonou or its surroundings, i.e., Abomey-Calavi, Sèmè-Kpodji and Porto-Novo.

• given their informed consent to participate to the study.

Non-inclusion criteria

Were not included:

• All people with a contraindication to the practice of physical activity as unstable angina, ventricular rhythm disorders, obstructive cardiomyopathies.

• Any woman who reported or had an objectified pregnancy.

Sample size N was calculated using Schwartz's formula. For this purpose, we used the prevalence of obesity in Benin, according to Acakpo's et al. results (16.8%) [1] and took into account an accuracy of 10%. N=(1.962 X 0.168 X 0.832)/0.102, or N=54. Out of a total of 242 adult obese subjects joined during the study period, only 173 agreed to participate to the study, i.e., a participation rate of 71.5%. But among the 173 consenting subjects, only 122 have really followed their program sessions to completion.

Course of the study

It was done in four main steps:

Identification of the study population

From Cotonou's gymnastics clubs, an awareness of overweight subjects was made, on the interest of the effort training program. The weight and height of those who agreed were measured for the calculation of the Body Mass Index (BMI). Those who had a BMI over 30 kg/m^2 were assessed before the program started. It was:

• A physical examination done by a rehabilitative medical doctor, to search signs of a contraindication of sustained physical activity,

• the measure of the Fat Mass Index (FMI).

• the lipid biological balance: Total, HDL and LDL cholesterolemia, triglyceridemia

• the exercise test on a cycloergometer (to determine the maximum resistance of the subject and the heart rate at the last pedaling step) and the walk test of six (6) minutes (determination of the distance traveled and dyspnea according to Borg scale).

Progress of the exercise training program

• It was carried out in groups of 15 to 20 subjects, depending on their availability. It was three weekly sessions, for a total of twenty (20) sessions for each patient. Each session lasted around 90 minutes and was structured as follows:

• **Warm-up:** Slow walking, active mobilization of the articular segments

• **Main part:** Brisk walking, pedaling of the ergometer or sports course, muscle strengthening exercises. These exercises were carried out in stages of progression.

• **Return to calm:** Slow walking, stretching.

Food hygiene awareness

These were monthly sessions. They were led by a nutritionist and a medical doctor of physical medicine and rehabilitation. Before the end of their 20th exercise program, each patient underwent two food hygiene awareness sessions. The first one was to make specifics recommendations to each patient. The second session was to evaluate each patient to assess the level of application of the recommendations made to him during the first session.

End of session evaluation

At the end of the 20 sessions, all the tests described in the first step, apart from the clinical aptitude examination, were resumed, looking for modifications.

Main variables

Type of obesity: It was established taking into account the clinical assessment of the mode of distribution of fat in the subject. When this distribution of fat predominates at the abdominal level, obesity has been called «android». If the distribution of fat is more marked at the level of the buttocks and thighs, obesity was said to be «gynoid» and when the fats are also marked at the level of the abdomen and pelvis, obesity was said «mixed». For this purpose, abdominal perimeter and waist circumference were measured. The abdominal perimeter was measured at the level of the navel. As for waist circumference, it consisted in measuring the largest perimeter of the pelvis.

Evolution of variables: It concerned the Body Mass Index (BMI), the Fat Mass Index (FMI), seated abdominal perimeter, waist circumference, total, HDL and LDL cholesterolemia. It was modifications obtained for these parameters of the study, by comparing values of the beginning and the end session. Thus, for each variable whose evolution we assessed, we categorized all the subjects as follows:

There was an improvement, for those whose beginning value of the variable considered was greater than that of the end. But for the HDL cholesterolemia level, we considered an improvement when the end value were less than for the beginning. We calculated the average improvement for each parameter. When this average improvement in the parameter is greater or less than the value of the improvement obtained by the subject, this improvement was said to be slight or significant respectively.

Status quo: Nothing has changed, we find the same value at the beginning and at the end.

Aggravation: Increase in the end value, compared to that at the start. The reverse were considered for HDL cholesterolemia.

Data processing and analysis

Data entry was done in Epi data version 3.1 and statistical analysis using STATA version 12.0 software. We used Student's t-test to compare means. Chi-square or Ficher test was used to compare distribution frequencies. All statistical tests were performed with a significance level of 5%.

To assess factors linked to the evolution of the parameters, we considered as "good" cases of slight and significant improvement and "bad" the status quo and aggravation groups.

Ethical considerations

Informed patient consent was required before inclusion in the study. Patients were not coerced to participate to the study: they could end their participation at any time during the evolution of the protocol. The study was carried out in strict and scrupulous respect for the confidentiality of the data collected.

RESULTS

General characteristics of the study patients

Socio-demographic characteristics: Subjects of the study had an average age of 46.3 ± 9.70 years. The extreme ages were 23 and 65 years old. Table 1 shows the distribution of patients according to different socio-demographic characteristics.

Table 1: Distribution of patients according to their socio-demographic characteristics.

		Numbers	Percentages (%)
Age			
	<35	16	13.11
	35–44	35	28.69
	45–54	43	35.25
	≥ 55	28	22.95
Sex			
	Female	115	94.26
	Male	7	5.74
Schooling level			
	None	12	9.84
	Elementary	21	17.21
	Secondary	58	47.54
	University	31	25.41

Profession		
Civil servant	47	38.52
Seller/Trader	46	37.7
Housewife	13	10.66
Worker/Artisan	7	5.74
Pensioner	5	4.1
Student	4	3.28

Clinical features of obesity: Fifty-six (56) patients (45.9%) had android obesity and the rest (54.1%) had mixed one. Table 2 presents the clinical characteristics of patients obesity.

Table 2: Distribution of patients according to their anthropometric and lipid characteristics.

	Minimum	Maximum	Mean	Standard deviation
BMI(kg/m²)	30.02	60.96	37.26	5.04
FMI(en%)	30.6	81.3	47.95	7.56
Distance walked in 6 mn(m)	274	663	491.32	74.8
Seated abdominal perimeter(cm)	104	145	115.9	12.34
Waist circumference(cm)	92	122	106.58	10.02
Triglyceridemia(g/l)	0.25	2.3	0.94	0.37
Total cholesterolemia(g/l)	1.25	3.91	2.16	0.45
HDL cholesterolemia(g/l)	0.24	1.92	0.57	0.18
LDL cholesterolemia(g/l)	0.72	3.05	1.42	0.4

Abbreviations: BMI: Body Mass Index; FMI : Fat Mass Index; HDL : High Density Lipoprotein; LDL: Low Density Lipoprotein.

Results of the exercise training program: Evolution of clinical and biological parameters of obesity in the study's subjects, between the beginning and the end of the exercise training program is presented in Figure 1.
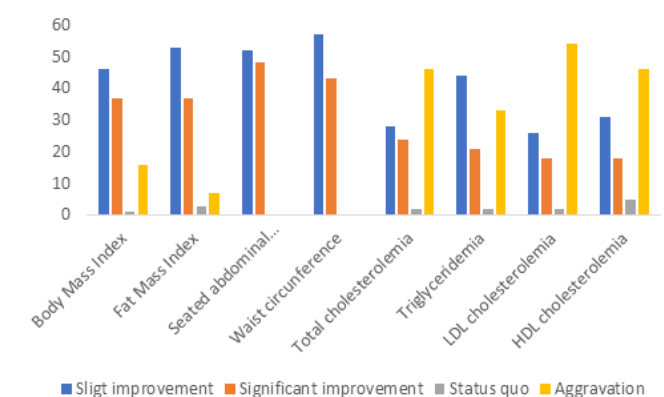

Figure 1: Evolution of clinical and biological parameters of obesity in the study's subjects, between the beginning and the end of the rehabilitation program.

Factors associated with program outcomes: None of the socio-demographic characteristics of the patients or the clinical data on their obesity had a significant influence on the evolution of the parameters studied. Table 3 provides a summary of the study of factors associated with BMI and BMI results in the study's patients.

Table 3: Summary of factors associated with BMI and BMI results in the study patients.

	FMI results		Statistical tests	BMI results		Statistical tests
	Good	Bad		Good	Bad	
Type of obesity			0.96			0.76
Androïde	51	5		47	9	
Mixte	60	6		54	12	
Age			0.56c			0.76
Mean	46.52	44.73		46.24	46.95	
SD	9.67	10.24		9.79	9.42	
Triglyceridemia			0.07			0.63
Mean	0.92	1.12		0.93	0.97	
SD	0.34	0.56		0.35	0.46	
Total cholesterolemia			0.55			0.96
Mean	2.16	2.24		2.16	2.17	
SD	0.45	0.49		0.42	0.59	
6 min walk test			0.65			0.92
Mean	490.33	501.27		490.99	492.9	
SD	75.6	68.75		78.18	57.33	

Abbreviations: BMI: Body Mass Index; FMI : Fat Mass Index.

DISCUSSION

Characteristics of the study's population

The sample of our study was marked by a predominantly female, 115 women (94.26%) against 7 men (5.74%). The female predominance of obesity in our context could be explained by the fact that:

• "curves" of a woman testify to the maintenance that she has on behalf of her husband, even of all her family in law.

woman is the main actress in the kitchen and could therefore be tempted by snacking

• women often have sedentary jobs

• culture of "outdoor sports by women" is not yet a daily reality

• Numerous deliveries, certainly also have their implication.

These results are still comparable to those of Ghroubi et al. [6].

In 2012, Djrolo et al. [7] reported this female prevalence of obesity in Benin, even if it was to a lesser extent. But, in others epidemiological studies, it appears that obesity is predominantly male [4,8].

Their study carried out in Switzerland, experienced a majority participation of women at 86% [8]. So is there a denial by men of their obesity or rather is it a lack of availability of these men, through their professional activities, to participate in these studies?

Clinical and biological characteristics of obesity in the study

Subjects of the study presented mainly android and mixed obesity (45.9 and 54.10%, respectively). Still in Benin, but in 2004, Dansou et al. reported android obesity for all subjects in their sample [9].

The average BMI of our population was 37.26 ± 5.04 kg/m². This result is comparable to that of Gaillard et al. with an average BMI of 37.7 kg/m² [9] and with an average BMI of 36.4 kg/m². The average fat mass index of the study subjects was 47.95 ± 7.56%, even reaching 61% in some cases. This is therefore a significant excess of fat mass index in these subjects. These parameters certainly contributed to a reduction in the endurance of the subjects with physical activity. In fact, if obese subjects in the study by Baillot et al. were older than ours, the average performance of the latter on the six (6) minutes walk test was reduced [10]. The average values of the lipid balance in the subjects of the study were generally good. This result confirms that the diagnosis of obesity is only clinical.

Results of the program and associated factors

Figure 1 shows that at the end of the program, the study subjects experienced an improvement in the clinical parameters of obesity (focusing mainly on the abdominal perimeter, waist circumference, fat mass index and to a lesser extent on the body mass index). Comparable results have been reported according to the literature review [11,12].

As for the biological parameters, their improvement was less marked. These results could be due to the fact that the initial biological disturbances observed in the subjects of the study were not marked. Watts et al. [13] as well as Lawani et al. [14] results were comparable to ours. On the other hand, Nicklas et al. have reported a significant reduction in triglyceridemia, total and LDL cholesterolemia following physical endurance training in obese patients [15]. As for Sunami et al. obtained a significant increase in HDL cholesterolemia after pedaling an ergometric bicycle at an intensity of 50% of the theoretical maximum load, for 60 minutes two to four times a week for 5 months [16].

These points of divergence observed in the results would be due to the great heterogeneity of the studies, as much for the type of program, its duration, the type of population studied as well as the size of the sample. Indeed, in the literature we observe a diversity of exercise programs for obese. It is either a high-intensity interval training program [17], an aerobic-dominated exercise program [12,14]. The duration of programs is either short (6 to 8 weeks) [12-14], or long (12 weeks and more) [17]. Results of physical activity on the lipid balance would be mainly related to the duration of the program, according to Brandou et al. [18].

Regardless of parameters studied, none of them had any influence on the results of the fat mass index or on those of the body mass index. These results are interesting and encouraging because they demonstrate the benefits to be hoped from the effort training sessions of the subjects does not take into account the type of their obesity, the age of patient, his functional capacities or the results of his lipid status.

CONCLUSION

Results of the rehabilitation program are generally encouraging, particularly with regard to the physical aspects of obesity. They are independent of the characteristics of obesity, encouraging them to apply the exercise program in all cases of obesity. However, our study was carried out over a short period with a predominantly female sample.

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